Natura 2000 yng Nghymru: Rhestr o Ddata Gofodol ar gyfer Nodweddion - Adroddiad Cryno

Natura 2000 in Wales: Inventory of Spatial Data for Features - Summary Report

Rhaglen Natura 2000 LIFE yng Nghymru
LIFE Natura 2000 Programme for Wales

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1. Crynodeb Gweithredol

Ym mis Chwefror 2014, dyfarnwyd contract i gatalogio data gofodol a gedwir gan CNC i wella ei hygyrchedd a thrwy hynny ei werth, gan gynyddu ei argaeledd ar gyfer defnydd cyffredinol. Mae'r contract a'r adroddiad hwn yn ffurfio rhan o Fylchau Tystiolaeth A9 ar gyfer rhaglen LIFE N2K.

Mae argaeledd data cynhwysfawr, manwl gywir a pherthnasol yn hanfodol i allu CNC i wneud defnydd llawn o GIS i gynorthwyo'r gwaith o reoli nodweddion Natura 2000. Er bod symiau sylweddol o ddata gofodol yn bodoli, mae rhai bylchau allweddol yn parhau yn y dystiolaeth sydd ar gael. Mae sicrhau cwmpas data gofodol llawn yn wynebu nifer o heriau: y brif her yw'r amser a'r adnoddau sylweddol sy'n angenrheidiol i gasglu data.

2. Executive Summary

In February 2014, a contract was let to catalogue spatial data held by NRW to improve its accessibility and therefore its value by making it more available for general use. The contract and this report forms part of the A9 Evidence Gaps for the LIFE N2K programme.

The availability of comprehensive, accurate and relevant data is fundamental to NRWs ability to fully utilise GIS to aid in the management of Natura 2000 features. Although a large amount of spatial data exists, there remain some key gaps in available evidence. Acquiring full spatial data coverage faces many challenges: the main being the large amount of time and resource required for the collection of data.

3. Introduction and rationale

Wales has 92 Special Areas of Conservation (SAC) for rare and threatened species and habitats, and 20 Special Protection Areas (SPA) for vulnerable bird species. These areas are known as Natura 2000 (N2K), which form part of a network of areas across Europe that have been designated for the protection of habitats and species considered of European importance for nature conservation. These habitats and species have been listed under Annex I and Annex II of the Habitats Directive (92/43/EEC) and Annex I of the Birds Directive (79/409/EEC).

The LIFE Natura 2000 Programme is run by Natural Resources Wales and funded by the European Union scheme LIFE+ Nature. The Programme aims to develop a strategic forward plan to manage and restore Natura 2000 in Wales, including Prioritised Improvement Plans for individual sites. To support this work it is necessary to assess gaps in the evidence on which management decision are based and identify how they may be addressed in the future.

Accurate knowledge about the distribution and extent of Natura 2000 habitats and species on Natura 2000 sites is a key element in being able to plan and monitor their conservation management. Knowing the spatial distribution of Natura 2000 features is also fundamental for decision-making and the development of policy. Information needs not only to be accurate and up-to-date but also easily accessible and in a format which can be used and shared readily.

While much work has been done in Wales on surveying the spatial distribution of wide range of habitats and species features, the data collected is not necessarily in a form which can be used readily in the context of Natura 2000 management. There are a number of reasons for this, for example: survey coverage of a feature may not be complete; the data may be out-of-date, the classification system used for the survey may differ from that used in Natura 2000 management; or the data is only available in numerous separate datasets with different standards and formats.

4. Aims

This study therefore, aims to create an inventory/audit of existing spatial data on the distribution of Natura 2000 features on SACs and SPA in Wales, which is available to Natural Resources Wales (NRW). The inventory will identify datasets and note their location, ownership, format, and appraise coverage and confidence in the data quality.

The full results of the audit are presented in *Natura 2000 in Wales Inventory of Spatial Data Inventory* (MS Excel spreadsheet).

The results are summarised in this report. Key findings from compiling the inventory are laid out, including limitations of the evidence base and gaps where further work is required.

5. Definitions

GIS: Computer-based Geographical Information Systems designed to capture, store, manipulate, analyse, manage, and present geographical data. Commonly used proprietary GIS products are MapInfo and ArcGIS. GIS provides a platform for the capture, storage and management of spatial data in a consistent, quantitative and accessible format whilst allowing it to be shared and presented visually to suit different audiences. GIS also allows for detailed manipulation analysis of spatial data to aid in the monitoring and evaluation of features both spatial and temporally. GIS is considered to be the appropriate format standard of feature distribution spatial data.

Feature: Habitat or species listed in the Habitats or Birds Directive, for which SACs or SPAs are designated.

Phase I habitat survey: Survey carried out by Countryside Council for Wales between 1979 and 1997 at a broad habitat level, with complete coverage for the whole of Wales

National Vegetation Classification (NVC) Phase II habitat surveys: Detailed surveys carried out on specific areas, based on Rodwell's methodology (2000).

Spatial data: Data that can be directly or indirectly referenced to a location on the earth's surface: Often through coordinates and topology.

Spatial resolution: The accuracy or detail in the representation of a mapped feature. Low spatial resolution refers to a less detailed mapping where higher spatial resolution refers to more detailed mapping.

Unit: Management unit within a Natura 2000 site, defined for management and planning purposes, delineated for example by land ownership, River Basin Management Plan water body, or feature extent.

6. Method

The study identified and appraised existing datasets relating to the spatial distribution of Natura 2000 Annex I habitats and Annex II species features. This study focused on the available datasets held centrally within NRW or otherwise easily available to staff.

Scope of the study has been limited to N2K features designated on Natura 2000 sites in Wales – it does not cover other habitats or species which occur on Natura 2000 sites. The study is also limited to datasets which include data which is of a higher spatial resolution than the 10km vector grid. This is because relatively high levels of detail and granularity, and therefore accuracy are required for the purposes of site conservation management.

To identify existing datasets, a series of meetings were held with relevant NRW habitat and species specialists. For each dataset, metadata was collected and an appraisal was made, according to the categories shown in Table 1 below.

The full information is presented in the *Natura 2000 in Wales Inventory of Spatial Data Inventory* (MS Excel spreadsheet).

Table 1. Categories used to describe and appraise Natura 2000 feature distribution datasets

Metadata/appraisal category	Description
Feature	Natura 2000 feature name (informal) to which the dataset relates
Habitat or species	Whether the feature is a habitat or species feature
Feature category	Feature category used by the JNCC
Storage location	Link and file path of the identified dataset
Dataset folder	Identified dataset storage folder name
File name	Identified dataset file name
Contact	NRW staff member to contact regarding the dataset
Format	Data format e.g. Mapinfo Tab, CVS
Type	The form of the data such as point, line, polygon or vector grid.
Projection	The map projection used by the data e.g. British National Grid, UTM, OS
Date	The date the spatial data was created/collated
Ownership	The owner of the data e.g. NRW, NGO, joint etc.
Restrictions on use	Any copyright or agreement that restricts the use of the data
Method of creation	The method used to create the data e.g. survey, digitisation of reports, remote sensing
Source of digitisation / survey	Key survey techniques or survey data used

Date range of data	Date range of source data
NVC components	Components of NVC surveys that are used to derive the distribution of the feature
Quality / confidence	A short commentary on the quality of the data
Link to key documents	A link to key documents which give information on the collation of the data
Coverage of designated sites	A summary of the overall coverage of the data
Limitations	A short description of the limitations of the data for showing the distribution of the feature
Further work required	Further work identified that could improve the quality of the data.

As each data set could cover multiple sites, a breakdown of the layers coverage on each site was recorded. This is to allow the user to identify the relevant dataset(s) for a given feature and/or site. Each site breakdown was linked back to the relevant row on the metadata tab.

Table 2. Categories used to describe the site breakdown

Field	Description
Site	Natura 2000 site name
Feature	Natura 2000 feature name (informal)
Format	Data format e.g. Mapinfo Tab, CVS.
Data type	The form of the data such as point, line or polygon.
Coverage	The coverage of data for the given site. For example complete coverage of the site or no data.
Information	A short description of the data available
Source code	A link to the unique identification code on the “metadata tab” which provides some basic metadata on the identified data set covering that site.
Feature category	Feature category used by the JNCC
Habitat or species	Habitat or species feature

Once factual information about a dataset had been collated, an appraisal of the dataset was carried out to establish the suitability and availability of the dataset for use relating to management of the Natura 2000 feature in question.

The coverage of the data on Natura 2000 sites was carried out using a visual assessment. If the feature was mapped throughout the site(s) it was assumed that the mapping of the feature was representative of the feature. If only part of the site was mapped, where possible, further examination of the sources of data was undertaken to assess the coverage of mapping. For example, if the data was abstracted from Phase 1 survey data, it was assumed to be complete due to the fact that Phase 1 achieved almost complete coverage across Wales. Where available,

monitoring reports were used to confirm the extent of the mapping of the distribution of the feature, for example, the report may indicate whether particular management units were covered. The appraisal assessed quality of the data, was a reflection on the completeness of the survey and the confidence of the survey technique. This information was obtained from the specialist or accompanying documentation with the dataset.

7. Limitations of the study

Resources available within this study did not allow for a full investigation of datasets relating to Annex I Birds Directive features.

The assessment of the coverage of data on the distribution of Natura 2000 features is qualitative, and based on a rapid review to provide general guidance to the completeness and quality of the data available. It should not be regarded as definitive.

The Inventory identifies datasets held by NRW centrally only. Resources were not available to carry out a systematic identification of datasets held in NRW regional offices.

Giving an overall assessment of confidence to the datasets was challenging. There was a degree of variation in professional opinion when determining the level of detail and quality of data. Also in some cases, the distribution data for a particular feature is collated from of several different source datasets with different levels of perceived confidence. For example, a dataset may be primarily derived from NVC survey data (which is of high confidence), but have used Phase 1 survey data (lower confidence) fill any gaps in NVC coverage. In such cases, no assessment of confidence was made.

Mapping derived from Phase 1 and Phase 2 NVC surveys, may not account for all examples of the habitats - small fragments are likely to be overlooked by the mapping methods used.

8. Results

A full list of the datasets identified by this study is shown in the Inventory. The inventory provides a detailed breakdown of information on the datasets for different features and sites along with information on storage locations and basic metadata.

It was identified that the main source of data for Natura 2000 features was from the collations undertaken for the Habitats Directive Article 17 2013 reporting round.

The data for habitat features are largely collated between NRW Evidence and Analysis Group and the Biodiversity Fisheries and Geodiversity Group. NVC data was used extensively as a source, and NVC classifications were correlated with relevant Annex I habitats to derive the new dataset. NVC data is highly detailed and accurate but targeted at specific areas, so Phase 1 data was generally used to fill any unsurveyed gaps. These datasets are generally owned by NRW and held in-house.

The main source of data for species data is the NBN gateway. Species data is sourced from a range of disparate locations, and is often not owned by NRW.

The majority of data available was in TAB format: the standard format of MapInfo GIS. The availability of the data varies on a site or feature basis with habitats feature have more representative data than species features. The data is largely available in in vector form (points or polygons).

Key findings:

- 62% of SAC features were mapped in sufficient detail and evaluated to be suitable to represent the features' extent on sites where they are a designated feature
- More data is available for Annex I habitat features (71%) than Annex II species features (43%)
- Detailed mapping of a further 13% of features across designated sites could potentially be achieved in-house without further survey work.
- 6% of features had been mapped partially, but not extensively enough to adequately represent the features distribution on sites where they are a designated feature.
- 14% of the features on had no detailed mapping available on sites where they are a designated feature.

Table 1: A summary of the data available for SAC features

Level of mapping	Annex I habitats mapped across designated sites (%)	Annex II species mapped across designated sites (%)
Available	71	43
Potentially obtainable without further field work	13	14
Identified as partial	3	13
No data identified	14	29

A summary of the findings for different habitat and species categories are shown in Appendix A below where each dataset was classified as follows:-

- **Available:** Where detailed mapping of the features extent is available across the range of sites it is designated on.
- **Partial:** Where detailed mapping of the features extent is available on some of the sites where the feature is designated, or partially covers sites where it is designated.
- **Missing:** Where no detailed mapping of the feature is available.

9. Conclusions

The distribution of features is well known through the reporting of features at the resolution required for the reporting on the implementation of the Habitats Directive. The resolution of which this is reported give a generalised view on the distribution of the features, suitable for looking at distribution at a European scale but lacks the detail required for local scale environmental studies. Striving to obtain coverage of all sites and features at a finer resolution, would give NRW a more accurate baseline to assess environmental changes both spatially and temporally and discern finer scale patterns in distribution.

Although a substantial number of GIS datasets showing the distribution of Natura 2000 features are available within NRW, they have been produced independently by multiple staff and are not in a consistent standard or readily available for general use. This has the potential to lead to an unnecessary duplication of work and can reduce the efficiency of work within or between departments and by external bodies. The process of collating data in a common accessible platform, with common data standards, will benefit all NRW departments with functions for Natura 2000 sites and features. It will facilitate easier access by all, reduce the potential for the duplication of work and ultimately increase efficiency and reduce costs.

The usefulness of the data is constrained by the completeness and accuracy of available spatial datasets. The accuracy of datasets vary as they are often created through a variety of methods for a variety of reasons, with different levels of associated confidence. For example NVC habitat surveys are considered of high accuracy but are often targeted to map specific areas. This has led to incomplete geographical coverage of feature mapping on some Natura 2000 sites. A more systematic approach to mapping Natura 2000 features would result in more consistent geographical coverage; however this is constrained by the higher resource requirements to obtain finer resolution mapping and the need to focus on areas of greatest need.

The cost of creating new habitat or species survey data is very high. Therefore, there is a need to re-use data beyond the original purpose for which it was collected. However, this approach has led to a reliance on old data that has the potential to be unrepresentative of the feature's current extent and collected with a method that has a lower level of perceived accuracy. In some cases data which has been collected for one purpose requires some manipulation in order to derive the Natura 2000 feature data. For example, there is often not a one to one translation between NVC surveys and certain Article 17 features, which leads to careful interpretation data being required. In addition to this there are often problems in identifying habitats in the field which can lead to features being reclassified during future surveys.

Acquiring full spatial data coverage presents many challenges: the main being the large amount of time and resources required for the collection of data. I addition to direct observation mapping (e.g. NVC), other methods of feature mapping are available, such as remote sensing and habitat or species modelling. However these methods have limitations, relating to the level of detail required for the monitoring of habitats and species and the need for extensive ground truthing. For example, feature mapping in the marine environment is based largely on the HabMap model rather than direct survey observations. Whilst this is the best available knowledge, further model validation and ground truthing would allow more confidence when managing sensitive marine features.

10. Recommendations for future work

1. Rationalise the storage and access arrangements for the datasets itemised in the Inventory to ensure that they are available easily from a single location.
2. Ensure all datasets are in a standard format for ease of use within and across departments.
3. Explore datasets held in NRW regional offices to help fill gaps in coverage.
4. Consult with relevant NRW species and habitat specialists, and those with local knowledge (such as NRW Conservation Officers and site managers) to validate map data.

Appendix A: Summary of Natura 2000 feature distribution data by feature category

1. SAC Habitats

A summary of data for each feature is presented in the tables.

Coastal sand dunes

The mapping of coastal dunes has good coverage across Wales and Natura 2000 sites. The source of information comes from a survey, which was largely carried out in 1991. Some changes in distribution are likely to have occurred since the undertaking of the survey, although it is considered to provide a reasonably good representation of the features extents. The data is adequate for more detailed analyses, assessments and visualisations, although it would be prudent to remember the potential changes in distributions that are likely to have occurred over the last 25 years.

Table 1: Summary of the data available for coastal sand dunes features within N2K sites where they are designated

Feature name	Availability of data	Comments on data
Dunes with *Salix repens ssp. argentea (Salicion arenariae)*	Available	Coverage in polygon data. Based on historic data and some changes in distribution are likely to have occurred.
Embryonic shifting dunes	Available	
Fixed dunes with herbaceous vegetation ("grey dunes")	Available	
Humid dune slacks	Available	
Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")	Available	

Forests

Existing data on the finer distribution of forestry features is lacking. A problem with forestry features is that there is often not a one-to-one translation from National Vegetation Classification Surveys (NVC) to Annex I features, so mapping requires specialist interpretation and is often needed on a site by site basis. Modelling work for some features has been carried out although the results are likely to contain errors in representing the spatial extent of the features and needs to be interpreted carefully. Forestry mapping was identified as lacking in the last Article 17 reporting round and more funding has been made available to increase the level of mapping.

Table 2: Summary of the data available for forestry features within N2K sites where they are designated

Feature name (as used in the Directive)	Availability	Comments on data
Asperulo-Fagetum beech forests	Missing	Available in 10km vector grids and point data. Lacking detailed mapping of the features extent across all designated sites.
Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer *(Quercion robori-petraeae or Ilici-Fagenion)*	Missing	
Bog woodland	Missing	
Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Missing	Available in 10km vector grids and point data. Lacking detailed mapping of the features extent across all designated sites. These features are directly extractable from Phase 2 surveys, so could be mapped where digital Phase 2 survey data is available.
Taxus baccata woods of the British Isles	Missing	
Tilio-Acerion forests of slopes, screes and ravines	Partial	Available in a mix of polygon and point data. The features distribution data was modelled so there are likely to be errors in its spatial representation. The datasets do not provide coverage of all sites (Coedydd Nedd a Mellte and Wye Valley Woodlands and Elan Valley Woodlands)**.** The feature is likely to be under-represented in Article 17 reporting as the 10km reporting grids do not cover Elan Valley Woodlands where it is listed as a designated feature.
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*	Available	Available in a polygon form. The features distribution data was modelled so there is likely to be errors in its spatial representation. Some regional detailed mapping has also occurred.

Freshwater habitats

Point data is available showing the location of water features attributed with the habitat feature. This could be used to attribute digitised water bodies with their designated feature to provide more detailed data on the distribution of freshwater habitats. This data would be adequate for more detailed analyses, assessments and visualisations of the features.

Table 3: Summary of the data available for freshwater habitat features within N2K sites where they are designated

Feature	Availability	Comments on data
Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp	Missing	Lacking detailed mapping of the features extent. Point data on the location of lakes with attributed features and digitised lake boundaries are available. Digitised lakes could be attributed with information on the lakes feature from the point data set to represent the location of these features.
Natural dystrophic lakes and ponds	Missing	
Natural eutrophic lakes with *Magnopotamion* or Hydrocharition-type vegetation	Missing	
Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	Missing	
Turloughs	Missing	
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	Available	Coverage in polygon data

Marine, coastal and halophytic habitats

The mapping of marine features is available in polygon form across all marine Natura 2000 sites. The distributions of subtidal features are largely based on partial data with some modelling whilst intertidal features are largely covered by the NVC surveys. Data sets are well attributed with the confidence of the mapping technique. Further mapping to verify the location of the map has been produced identifying future mapping work priorities, which gives a high priority to areas of un-surveyed Natura 2000 sites. Annual vegetation of drift lines has poor coverage due to the transient nature of the feature, which makes mapping more complex.

Table 4: Summary of the data available for Marine, coastal and halophytic habitats within N2K sites where they are designated features

Feature	Availability	Comments on data
Coastal lagoons	Available	Coverage in polygon data. A lot of feature mapping is based on models so verification and ground-truthing is required
Estuaries	Available	
Large shallow inlets and bays	Available	
Mudflats and sand flats not covered by seawater at low tide	Available	
Perennial vegetation of stony banks	Available	
Reefs	Available	
Salicornia and other annuals colonising mud and sand	Available	
Sandbanks which are slightly covered by sea water all the time	Available	
Atlantic salt meadows	Available	
Vegetated sea cliffs of the Atlantic and Baltic coasts	Available	
Annual vegetation of drift lines	Missing	No detailed mapping identified for the feature on its designated sites in Wales.

Natural and semi-natural grasslands

The features are generally well mapped within SACs where they are a designated feature with only a few exceptions: Calaminarian grasslands on the Elenydd and Hydrophilous tall herb fringe communities on the Brecon Beacons and Cadair Idris. This data is largely useful for more detailed analyses, assessments and visualisations of the features, though some of the data is potentially quite old. The main sources of data for the mapping of features is from Phase 2 surveys, which do not have full coverage and is more limited in upland areas. Surveys are also likely to have to have excluded smaller patches of features from surveyed areas. The detailed mapping of these features is likely to increase as more Phase 2 surveys are completed.

Table 5: Summary of the data available for Natural and semi-natural grasslands within N2K sites where they are designated features

Feature	Availability	Comments on data
Alpine and subalpine calcareous grasslands	Available	Coverage in polygon data
Calaminarian grasslands of the *Violetalia calaminariae*	Partial	Data for this feature is considered moderately complete. No data available for the Elenydd.
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	Partial	No detailed mapping is available for the Brecon Beacons and Cadair Idris with only limited mapping available for Eryri.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Available	Coverage in polygon data
Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)	Available	Coverage in polygon data
Siliceous alpine and boreal grasslands	Available	Considered a partial dataset although it is likely to give a good representation of the distribution of the feature on Eryri.
Species-rich *Nardus* grassland, on siliceous substrates in mountain areas	Available	Good detailed coverage of the feature although some strands are likely to be missing.

Temperate heath and scrub

Data is available for all Natura 2000 sites where there is a designated temperate heath and scrub feature. The finer resolution data is often in a mix of detailed polygons and 1km vector grids and is inconsistent between and/or within sites. To obtain consistent mapping format for these features it may be required to covert the polygon data to 1km vector grids or carry out further mapping to detailed polygons. Nevertheless, the data is useful for more detailed analyses, assessments and visualisations of the features.

Table 6: Summary of the data available for temperate heath and scrub features within sites where they are designated features

Feature	Availability	Comments on data
Northern Atlantic wet heaths with *Erica tetralix*	Available	Coverage with finer resolution data but this is often in a mix of formats and inconsistent between sites (polygons or 1km grid).
European dry heaths	Available	Complete with finer resolution data but this is often in a mix of formats and inconsistent between sites (polygons or 1km grid).
Alpine and Boreal heaths	Available	Coverage in polygon data

Raised bogs and mires and fens

The extensiveness of finer resolution mapping varies depending on feature and site. Therefore the usefulness of the data for detailed analyses, assessments and visualisations of the features varies. The identified data gives the best estimate of the extent and distribution of these features with the currently available data. The completion of the Lowland Peatland Survey of Wales is likely to improve the quality of finer resolution data available.

Table 7: Summary of the data available for raised bogs and mires and fens features within N2K sites where they are designated features

Feature	Availability	Comments on data
Active raised bogs	Partial	Coverage in polygon data. No detailed mapping is available for Cors Caron and Cors Fochno, and only partial data for Afon Cleddau. No detailed data was available centrally for Afon Eden and Fenn's Whixall.
Alkaline fens	Available	Coverage polygon data which provides a reasonably accurate representation of the distribution of this habitat but it is not regarded as comprehensive.
Alpine pioneer formations of the *Caricion bicoloris-atrofuscae*	Partial	Partial data is available for Eryri as most occurrences of this habitat are small patches, so are likely to be missed by surveys and the survey data may not be complete.
Blanket bogs	Available	Complete with finer resolution data but this is often in a mix of formats and inconsistent between and/or within sites (polygons or 1km grid). Provides a reasonably accurate representation of the distribution of this habitat but it is not regarded as comprehensive.
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	Available	Coverage in polygon data.
Degraded raised bogs still capable of natural regeneration	Partial	Available in polygon format. No detailed data was found centrally for Cors Caron, Cors Fochno and Fenn's Whixall.
Depressions on peat substrates of the *Rhynchosporion*	Partial	There is detailed mapping available for Preseli and Eryri although it is not likely to be comprehensively mapped. No detailed data is available for Cors Caron, Cors Fochno and the Rhinog.

Petrifying springs with tufa formation (*Cratoneurion*)	Available	Available in polygon form which provides a reasonably accurate representation of the distribution of this habitat but it is not regarded as comprehensive.
Transition mires and quaking bogs	Partial	Coverage in polygon. No detailed mapping is available for the Berwyn a Mynyddoedd de Clwyd, Cors Caron and River Wye.

Rocky habitats and caves

There is a broad knowledge on the wider distribution of rocky habitats and caves features although further studies are required to confirm the location and extent of the features. There is a lack of mapping on the finer distribution for the majority of features.

Table 8: Summary of the data available for rocky habitats and caves features within N2K sites where they are designated features

Feature	Availability	Comments on data
Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	Available	Coverage in polygon data. Considered a partial data set with further work required to confirm the location and extent of the habitat.
Calcareous rocky slopes with chasmophytic vegetation	Missing	No detailed mapping for all sites
Caves not open to the public	Missing	Available in 10km vector grids. No detailed mapping.
Siliceous rocky slopes with chasmophytic vegetation	Missing	Available in 10km vector grids. No detailed mapping.
Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)	Partial	Coverage in polygon data. Although it is only considered only a partial data set it is likely to give a good representation of the location and extent of the habitat on Eryri. Only a small area has been mapped on Cadair Idris.
Submerged or partially submerged sea caves	Available	Point data showing the location of known sea caves is available for all sites. Point data is adequate for showing the finer distribution of this feature.

2. SAC Species

A summary of data for each feature is presented in the tables.

Vertebrate species: Fish

There is a good broad knowledge of the distribution of fish species features on river sites. However, there is a lack of knowledge on the distribution of features on marine sites. Data is often representing different stages of the life cycle (e.g. occupied rivers or spawning grounds) and some species are grouped due to their similarities in distribution and/or identification.

Table 9: Summary of the data available for fish species within N2K sites where they are designated features

Feature	Data summary
Allis shad Twaite shad	Data showing the spawning grounds of the feature on river sites. Does not cover marine sites. The dataset does not distinguish between Allis and Twaite Shads.
Bullhead	Data is available showing occupied rivers sections.
River lamprey Brook lamprey	Data is available showing the distribution of the features within river sites. River and Brook lampreys cannot be distinguished morphologically. These features are widespread in Wales and patchiness is likely to do with survey effort and Identification issues. Mapping does not cover life stages of River lamprey on marine and estuarine sites due to lack of information on the use of sites by the feature.
Atlantic salmon	Data showing spawning grounds for the North region is available.
Sea lamprey	Data is available showing the spawning grounds of the features in River sites. Mapping does not cover life stages of Sea lamprey on marine and estuarine sites due to lack of information on the use of sites by the feature.

Invertebrates: Molluscs and arthropods

The availability of finer resolution mapping varies depending on feature and site. Detailed mapping is in a mix of sightings data, identified suitable habitat and modelled extents. Where no data GIS data is available there are a number of un-digitised reports which contain some detailed mapping.

Table 10: Summary of the data available for invertebrate features within N2K sites where they are designated features

Feature	Summary
Desmoulin's whorl snail	No MapInfo data but un-digitised reports exist that contain maps of known distribution and suitable habitats.
Geyer's whorl snail	Habitat mapped on Corsydd Môn and un-digitised reports exist that contains maps of known distribution and suitable habitats for Corsydd Llyn.
Narrow-mouthed whorl snail	Some habitat suitability mapping has occurred and some sighting records are available
Southern damselfly	Some Mapinfo data and un-digitised reports are available for Corsydd Môn. Data showing rivers which have species present for the Gower Commons. Gweunydd Blaencleddau has line data showing rivers where damselflys are known to occur. Some locations on Preseli have been mapped on GIS.
Marsh fritillary	Modelled data is available for all sites except for Preseli.

Vertebrate species: Mammals

Data for mammal features is available through the National Biological Network (NBN). There is also some modelling data and analysed sightings data held in NRW. The combined data available should allow the mapping of features at a finer resolution.

Table 12: Summary of the data available for mammal features within N2K sites where they are designated features

Feature	Data Summary
Otter	The Otter Survey of Wales uses standardised methodology (surveys for spraints at a selection of sample sites used repeated every few years) to provide information on changes in distribution and population trends. The OSW is available as a GIS layer and shows the presence of positive signs of otter by catchments. It is more reliable than using a rivers layer as we cannot confirm presence on all rivers. The NBN does provide some data, but the LRC data (also on NRW GIS system) is more reliable as the data are verified and validated. NRW is working with Cardiff University Otter Project (using their data from road casualties of breeding females or cubs, and NRW data from the MISE project) to collate information to indicate possible breeding sites, though this would be a general area in most cases rather than a specific holt.
Barbastelle bat	Point data of some roosts is available. The location of the majority of roosts is not known. No hibernation roosts are known. Modelling work has also been carried out to identify potential habitat. There is currently no standard method for monitoring breeding or hibernation roosts.
Lesser horseshoe bat (LHB) Greater horseshoe bat (GHB)	For the Lesser Horseshoe Bat and Greater Horseshoe Bat, GIS data exists that shows all known roosts and nurseries and some modelling of potential foraging grounds. The data for LHB is more comprehensive than that of the GHB.
Bottlenose dolphin Grey seal	Data on sightings, observer adjusted sightings and tagging data is available from the Marine Mammal Atlas.

Lower plant species

The finer resolution data is in different formats between the features. The data on the Petalwort is more useful for showing the finer distribution of the feature. Data for the slender green feather moss has limited use for showing the finer distribution of the feature.

Table 12. Summary of the data available for lower plant species within N2K sites where they are designated features

Feature	Data Summary
Slender green feather-moss (*Drepanocladus vernicosus*)	Data from the British Bryological Society database on the NBN provides records at a 100m or 10m accuracy. A dated version of this is available through MapInfo.
Petalwort (*Petalophyllum ralfsii*)	Data is available showing occupied dune slacks and known localities to 10m accuracy.

Higher plant species

No data was found for higher pant species features.

Table 13. Summary of the data available for higher plant species within sites where they are designated

Feature	Data Summary
Floating water-plantain	Data for the River Dee is available in the North region folder.
Early gentian	No data found
Killarney fern	No data found
Shore dock	No data found

Vertebrate species: Amphibians

Data is available for the detailed mapping of two Great crested newt sites. Point data of sighting from the NBN is available for all sites but is less useful for representing the distribution of the species.

Table 12. Summary of the data available for amphibian species within N2K sites where they are a designated feature

Feature	Data Summary
Great crested newt	Data available for some sites in point form showing known occupied ponds and buffered to show foraging ranges. Data from the NBN is available for other sites.